

REMARKS

Claims 1 and 3-36 remain pending in the application. Favorable reconsideration of the application is respectfully requested in view of the following clarifying comments.

I. REJECTION OF CLAIMS 1 AND 3-36 UNDER 35 USC §103(a)

Claims 1 and 3-36 now stand rejected under 35 USC §103(a) based on *Tanaka-SID* in view of *Tanaka et al. '688*, alone or in combination with one or more tertiary references. Applicant respectfully requests withdrawal of each of the rejections for at least the following reasons.

The Examiner continues to reject the claims on the basis that it would have been obvious to utilize the principles of detecting a change in capacitance of a pixel due to direct touch as taught in *Tanaka-SID*, with an active matrix display as taught in *Tanaka et al. '688*. Applicant must again respectfully disagree based on the following detailed arguments.

a. Tanaka-SID and Tanaka et al. '688 Operate in Fundamentally Different Manner than Present Invention

Both *Tanaka-SID* and *Tanaka et al. '688* teach that the sensor element is formed at the cross-section of two addressing lines which are directly connected to the sensor element 100% of the time. Conversely, according to the present invention the sensor element is located within the optically variable portion of the active matrix cell. Moreover, the sensor element is disconnected from the addressing lines by the pixel switch for the majority of the display operation period. In other words, although the Examiner may argue that *Tanaka-SID* method of detecting a change in capacitance due to touch may be applied to an active matrix display (e.g. in combination with *Tanaka et al. '688*) it may not be applied to an active matrix sensor formed by the pixel as in the

present invention. Such distinction is important since, as described below, this creates all sorts of technical problems to access and read-out the sensor data.

Tanaka-SID:

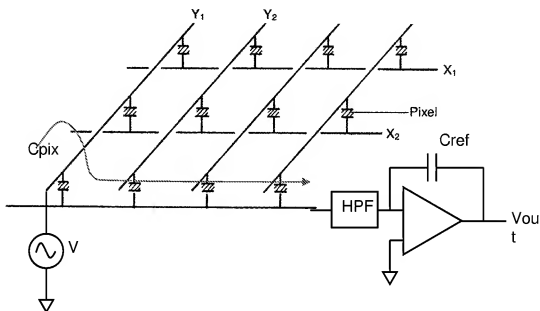
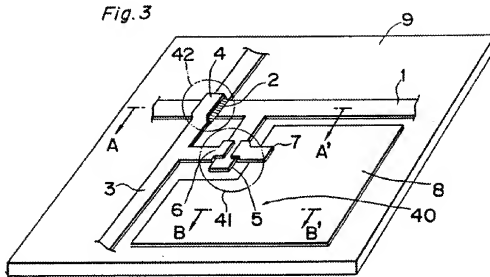


Figure: Capacitance measuring method for passive matrix LCD [*Tanaka-SID*]

The above Figure illustrates the principle of operation of the capacitance measuring method taught in *Tanaka-SID*. As in any passive matrix display, the liquid crystal material of a given pixel is located at the intersection of intersecting addressing lines. The liquid crystal material is coupled directly to the intersecting addressing lines (i.e., the row and column lines) 100% of the time. Thus, to the extent the liquid crystal material at a given intersection of addressing lines represents a capacitive sensor element according to the method taught in *Tanaka-SID*, the sensor element is directly coupled to the intersecting addressing lines 100% of the time. The same may be said as well with respect to *Tanaka et al.* '688 as described below.

Tanaka et al. '688:



As is shown in Fig. 3 as reproduced above, *Tanaka et al. '688* teaches that the sensor signal is generated within the photodetecting section 42. As is shown in detail in Fig. 4a of *Tanaka et al. '688*, the photodetecting section 42 is interposed directly between the addressing lines (i.e., source line 3 and the gate line 1 at the intersection 4). Thus, to the extent the photodetecting section 42 in *Tanaka et al. '688* represents the sensor element for the active-matrix display, the sensor element is directly connected to the intersecting address lines 100% of the time.

Accordingly, both *Tanaka-SID* and *Tanaka et al. '688* teach that the sensor element is directly connected to the intersecting address lines 100% of the time. Despite *Tanaka et al. '688* teaching an active-matrix type display, the sensor still is located so as to be connected to the intersecting addressing lines 100% of the time.

Present Invention:

Claim 1 recites how the sensor signals in accordance with the present invention are generated by and within the optically variable region of the display picture elements. The sensor signals are then output to the column data lines in response to external stimuli. In other words, the optically variable region (e.g., the liquid crystal) is not connected to the intersecting addressing lines 100% of the time.

b. Claimed Invention Would Not Have Been Obvious

For at least the above reasons, the present invention would not have been obvious in view of the references. Whether taken alone or in combination, neither *Tanaka-SID* nor *Tanaka et al. '688* teach or suggest the claimed configuration. Specifically, neither reference teaches or suggests an arrangement in which the optically variable region (e.g., liquid crystal) that produces the sensor signal is not connected to the intersecting addressing lines 100% of the time, as recited in claim 1. Thus, the rejection is improper and should be withdrawn.

Such distinctions between the present invention and the techniques taught in *Tanaka-SID* and *Tanaka et al. '688* are significant for several reasons. For example, the combination of *Tanaka-SID* and *Tanaka et al. '688* results in a touch display which is subject to problems arising from high parasitic capacitance. More specifically, *Tanaka-SID* teaches that a change in capacitance is detected by applying a high frequency signal. (p. 319, first column, second paragraph). Thus, in combination with an active-matrix display as taught in *Tanaka et al. '688*, the high frequency source is coupled to the capacitance of the pixel sensors all at the same time and 100% of the time. This presents a significant parasitic capacitance and significant problems associated therewith.

For example, as the pixel count increases the time during which each pixel is sensed is reduced and the frequency of the signal that is applied must be increased. This high frequency signal is then filtered out by the parasitic effects of the panel with the result that no measurable signal can be detected.

Another limitation of the combination proposed by the Examiner is that the large parasitic capacitance makes it susceptible to noise interference. The sum of all signals parasitically coupled to the counter plate creates fluctuations in the voltage of the counter plate. Although the individual fluctuations may be small, the combined current noise floor from all sources (including those from outside the display module, for example from the host terminal or the human body) can become high enough to make it difficult to detect the signal current.

Further, this structure and method of operation assumes that applying a high-frequency alternating signal to the common electrode will produce no deleterious effects on the display image quality.

For at least the above reasons, applicant respectfully submits that *Tanaka-SID* and *Tanaka et al. '688* taken alone or in combination do not teach or suggest each and every feature of the claimed invention. Nor do *Tanaka-SID* and *Tanaka et al. '688* teach or suggest the above-described advantages associated with the claimed combination. Moreover, the tertiary references fail to make up for such deficiencies. Withdrawal of the rejection is respectfully requested.

II. CONCLUSION

Accordingly, all claims 1 and 3-36 are believed to be allowable and the application is believed to be in condition for allowance. A prompt action to such end is earnestly solicited.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Should a petition for an extension of time be necessary for the timely reply to the outstanding Office Action (or if such a petition has been made and an additional extension is necessary), petition is hereby made and the Commissioner is authorized to charge any fees (including additional claim fees) to Deposit Account No. 18-0988.

Respectfully submitted,

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